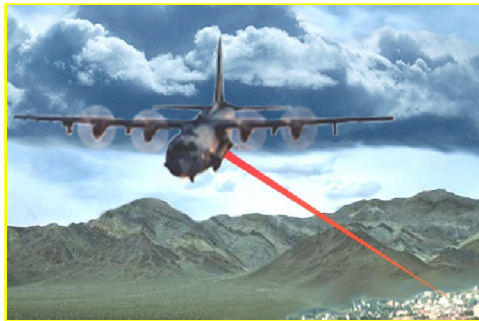




Joint Non-Lethal Weapons Program

Technology and Programs Panel





Purpose

- *Provide* an introduction to non-lethal technologies and challenges.
- *Allow* Industry to meet some of the DoD NLW technology leaders
- *Address* technology questions as well as human effects, legal and treaty compliance.
- *Inspire* Industry to develop next generation technology Non-Lethal Weapons



Panel Members

- Dr. Kirk Hackett – DUSD (S&T/WS)
- Mr. Kevin Stull – Naval Sea Systems Command
- Mr. John Cline – US Army Armaments RDEC
- Mr. George Gibbs – Marine Corps Systems Command
- Mr. Glenn Shwaery – University of New Hampshire
- LtCol Mark Wrobel – Joint Non-Lethal Weapons Directorate
- Mr. Joe Rutigliano – HQMC JA



Lasers as NL Weapons: *Status*

- Dazzlers
 - Red and Green wavelengths: temporary and safe visual impairment
 - Handheld versions available with nominal effective range ~10-50 m
- Laser Induced Plasma Flash-Bang
 - IR wavelengths: potential effects via audible report and bright flash
 - Additional R&D needed to characterize effects & reduce size and weight
- Multi-Spectral Pulsed Laser
 - Some concepts have shown the ability to create nausea/impairment
 - Effects are anecdotal
- High Energy Lasers
 - Wavelengths: 1.06, 1.35, and 3.8 microns



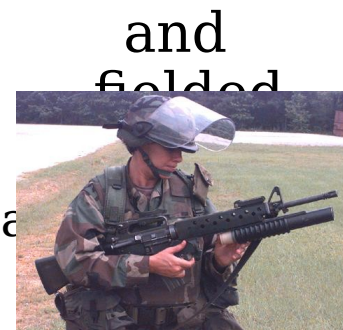
Lasers as NL Weapons: *Challenges*

- Target Effects Characterization
 - Equipment Susceptibility
 - Biological Effects and Safety Thresholds
- Scaling to High Power
 - Goals:
 - Electric laser deployed on a UAV
 - Handheld/crew-served counter-personnel laser with scalable effects
- Beam Control
 - Aim-point maintenance
 - Atmospheric compensation



US Army Technology Perspective

- Domination, not Frustration:
 - The future force goal is full spectrum domination
 - A past frustration was lethal response or no response
- This led to multiple NL munitions grenades being developed and for existing weapon platforms:
 - 12 Ga, 40mm, 66mm, hand-thrown and pre-empl
- These technologies have relied on:
 - Riot Control Agents (e.g., CS, CR, OC)
 - Rubber /PVC/Sponge projectiles
 - Pyrotechnic flash-bang distraction
 - Short-range, and/or tethered electric stun
 - Pre-emplaced mechanical devices & entangle





US Army Technology Perspective

- The current fielded technologies are only the 1st generation of NL force options:
 - primarily low tech
 - short range
 - range & population variable in their effect
 - mostly Counter-Personnel capabilities
- The next step is:
 - to develop advanced, longer range, technologies and planned platform (man-portable to vehicle-mounted) integrated NL capabilities
 - to provide Scaleable Effects for the Future War, the Future Combat System, and Joint Service





US Army Technology Perspective

- Technology Challenges

- Revolutionary NL Payloads / Effectors:

- Cost Effective
 - Minimal Logistics Burden & Training Burden
 - Negligible Adverse Environmental Impact / Clean-Up
 - Legally (e.g., Law of War & CWC Compliant) & Publicly Acceptable
(and Soldier Acceptable, e.g., Enabling Less Restrictive RoE)

- Controlled Dose of Kinetic Energy regardless of Range

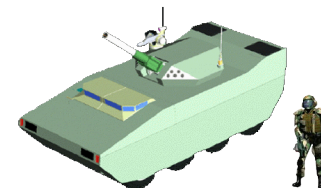
- Projected, Wireless, Electric Stun

- Scaleable Effects (Lethal to Non-Lethal)

- From Binary (e.g., Under/Over) to Rheostatic (Tunable)

- Multi-Function / Multi-Mission Effects

- Integrated Platforms: Counter Personnel & Counter Materiel
 - Reactive (Crowd Control) to Proactive (Shaping)



120mm Mortar System
FCS / Objective Force





Mobility Denial System

Anti-Traction Material

Government Formula: Polyacrylamide powder
mixed with water to produce
an extremely slippery surface

Acts on: Concrete, asphalt, mowed grass, packed
earth, and wood, tile, and vinyl floors

Man-Portable System



Weight: 70 pounds
Range: 5-20 feet
Capacity: 5 gallons of water/ATM powder

Vehicle-Transportable System



Fits into the back of open-backed HMMWV
Weight: 900 pounds
Range: 100 feet
Capacity: 300 gallons of water/ATM powder



Other Initiatives

- Clear – A – Space Devices
 - Distract / disorient personnel
 - Clear Facilities without Entering
- Neuromuscular Disruptor Technology
 - Long range
 - Wireless
 - Area



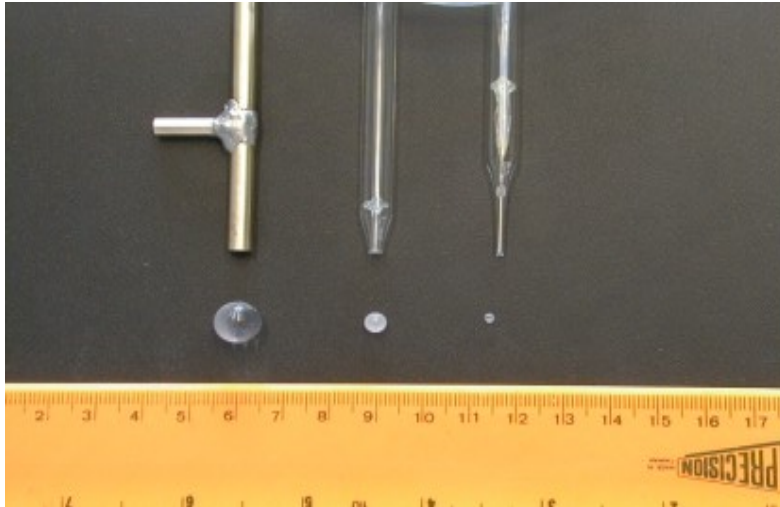
Non-Lethal Technology Innovation Center

at the University of New Hampshire
Several technologies are potentially of interest
pending technological breakthroughs:

- Infra-sonic, sonic, ultra-sonic – need universal, reproducible, scalable bio-effects
 - Hailing devices to directional anti-personnel devices
- High strength entangling materials – need commercial amounts of reproducible quality
 - Spider silk has the tensile strength of Kevlar but six-fold the elasticity

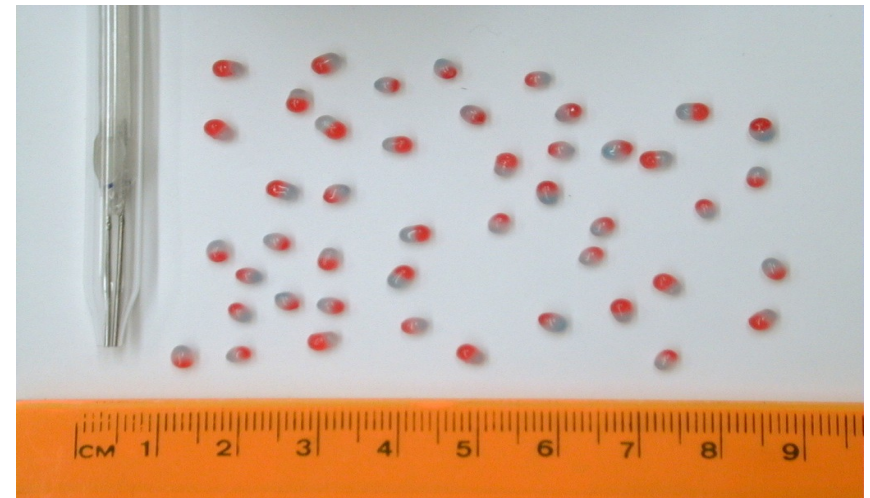


Encapsulation technologies



- Compartmentalization allows the chemistry to occur on demand
- From anti-traction to epoxies

- Investigate the chemistry of encapsulating materials for area denial
- Vary volume, shell rupture pressure, and adhesion





Rigid foam chemistry



Technological advancements in cure time, hardness/density, and adhesion increase the potential application of these epoxies and polyurethanes.

- Area denial
- Disable equipment/weapons
- Thermal considerations
- Materiel recovery considerations





NLW Effects and Effectiveness

NLW
Parameters

Stimuli:
Light
Sound
Kinetic
Energy
Directed
Energy



“Physical”

Probability of Intended effect
Probability of Non-
Permanent injury
Probability of Permanent
injury
Probability of Kill

Human Response

“Psychological”

Probability of Individual
Response
Probability of Group
Response



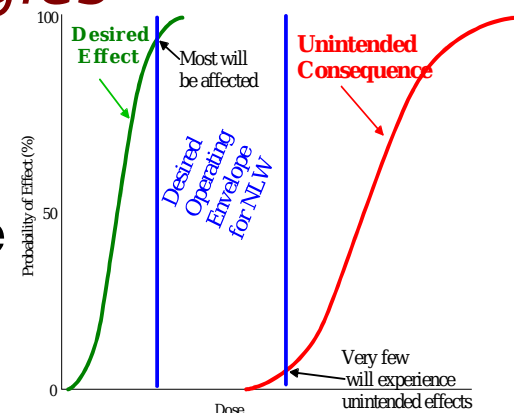
*Both the “effect” and
“effectiveness” must be
clearly understood...*



NLW Human Effects Challenge

Provide quality effects data to support Warfighter confidence in NL technologies

- How is effectiveness measured?
 - Conventional weapons – P_k
 - NLWs – Much more complex challenge
- How are risks portrayed?
 - Maturing models of injury prediction
- The New NL Technology Parameter Spaces:
 - Differentiating effects vs effectiveness
 - Provide an index of “safety”
 - Quantifying target behavior response
 - Accounting for variations in populations
 - Addressing sensitive populations vs intended targets





JNLWP Human Effects Process

Human Effects Center of Excellence

A team of government experts providing NLW human effects assessments

Human Effects Review Board

Independent government review by Service Surgeon General reps

NLW PMs

Milestone Decision Package

MDA

Human Effects Characterization Process

Human Effects Advisory Panel

Independent non-government review

Milestone Decisions

Fielded Capabilities



NLW Legal Review Process

The JNLWP legal review process ensures that the intended use of each weapon, weapon system, or munition is consistent with all applicable domestic law and treaties, and international agreements, customary international law, and the law of armed conflict (also known as the laws and customs of war) .

The legal review process meets the requirements of:

- DoD Directive 5000.1, 12 May 03, The Defense



NLW Legal Review Process

- To date the JNLWD has pursued preliminary legal reviews through the Navy Judge Advocate General pursuant to the Joint Services Memorandum of Agreement
- Once a NLW program lead assigned to a Service, that Service is responsible for legal review



Treaty Compliance Review Process

- All DoD activities shall be fully compliant with arms control agreements of the US. (DoD Directive 2060.1, 9 Jan 01, Implementation Of, And Compliance With, Arms Control Agreements).
- The JNLWP routinely provides presentations to DoD Weapons Compliance Review Groups